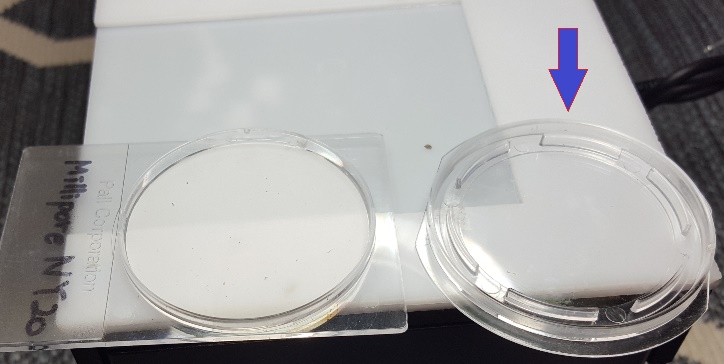
**Filter contamination analysis system simple manual Two-Shot**

Photo of the two-shot system appearance：

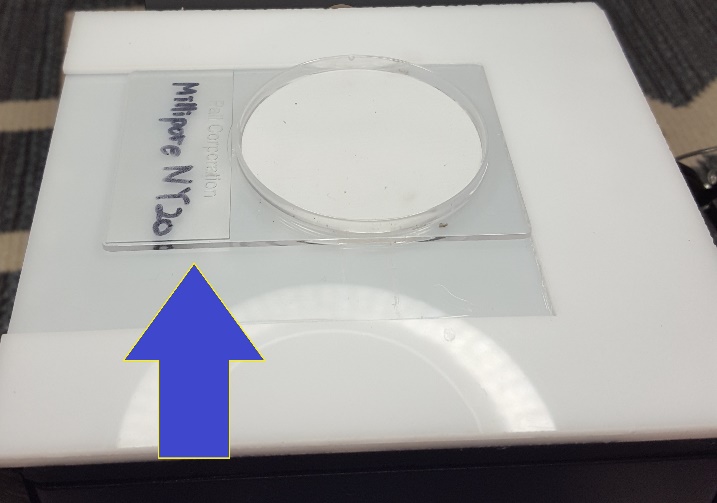


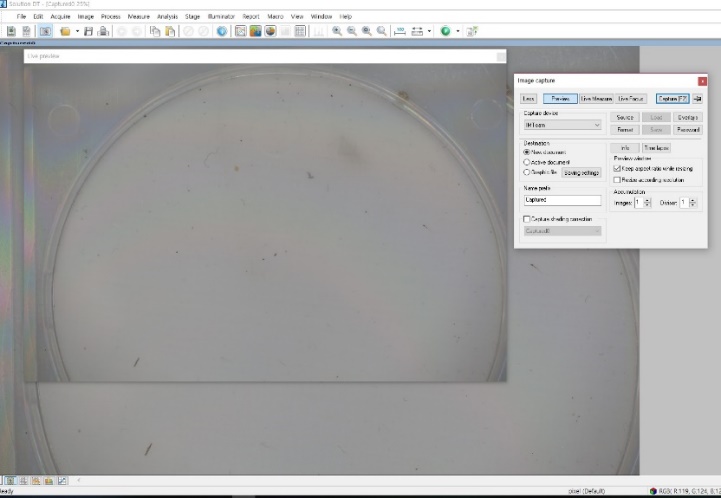
Specimen:

Please open the cover when taking a picture of the specimen.

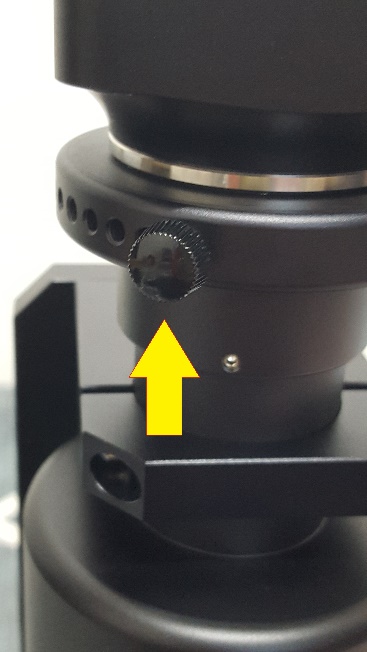
Step-1

Please place the specimen as follows.

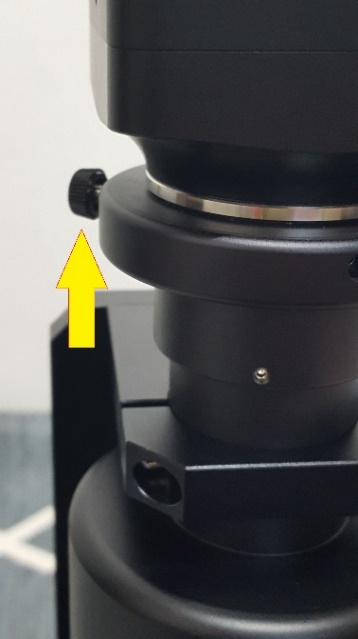


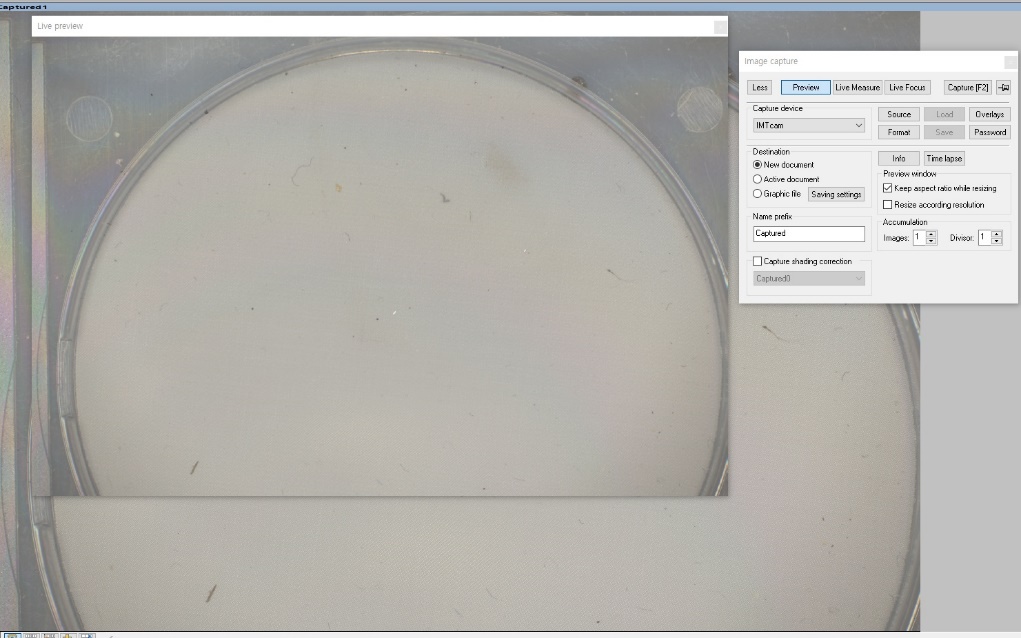
At this location, the screen should look like this:

The picture is polarized filter applied. The screen will have a slightly darker color, and all particles will have darker color as well. The polarization effect can be created by moving the knob. If you need to find and analyze metal particles only, move the knob to the front so that all particles are acquired in **dark polarized picture**. Then move the knob reversely and some particles are acquired **brightly in non-polarized picture.**

The polarizing knob should be positioned as shown below. **Picture Acquisition \_1**

Step-2

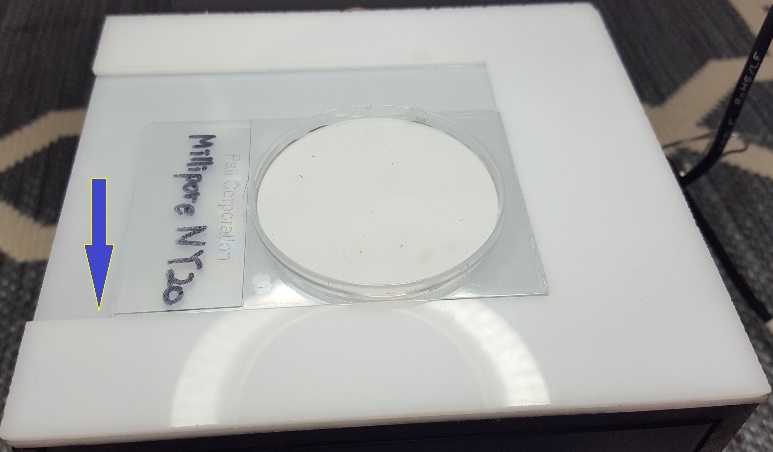
After the picture acquisition \_1, position the polarizing knob backwards as shown below. Never try to move the specimen at this time. The sample must be exactly in the same position.

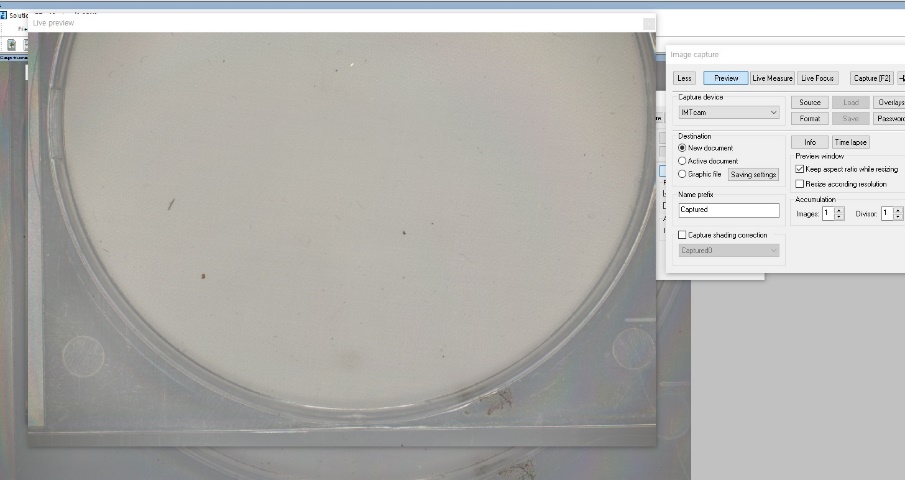


**Picture Acquisition \_2**

Step\_3

After acquiring picture\_2, move sample as below.

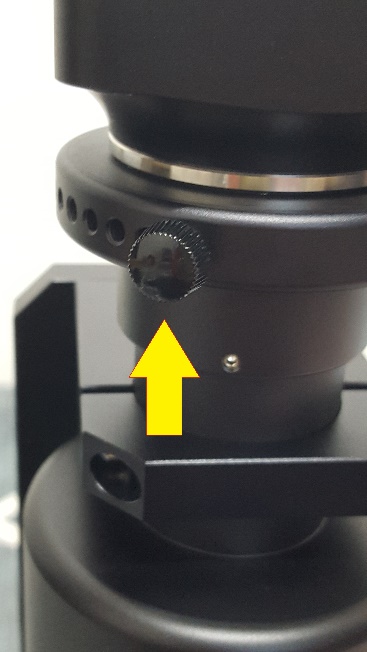


The screen will look like this:

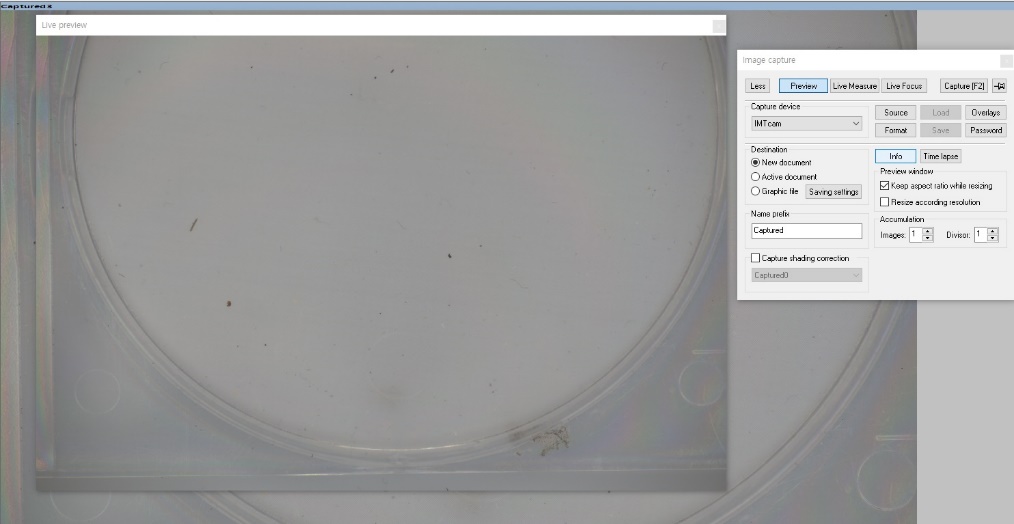
**Picture Acquisition \_3**

Step-4

After acquiring picture\_2, position the polarizing knob forward as shown below. The polarizing effect is applied again.



The screen will change to a darker image as shown below.

****

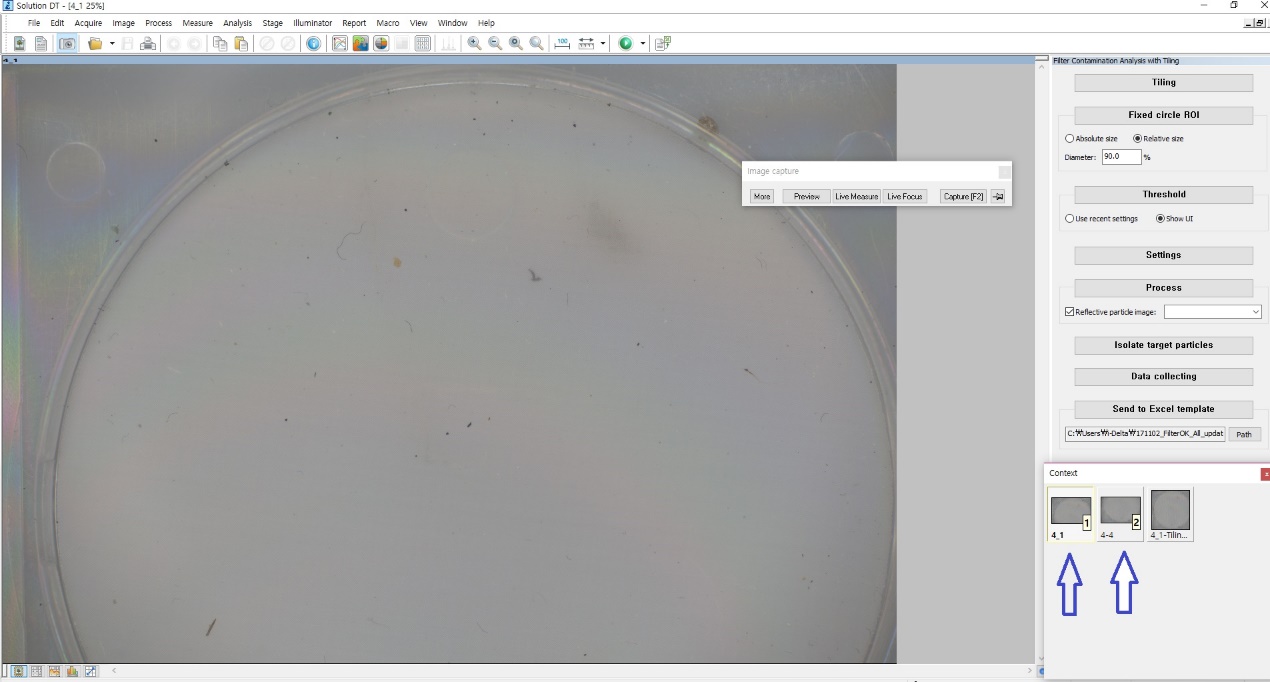
**Picture Acquisition \_4**

Once you've got 4 pictures, click on the "Tile" menu and it will automatically create 2 full pictures that have been tiled.

****

If you do not need to separate metal particles, you do not need 4 pictures. Move the specimen in the state where the polarizing knob is located (applying polarized effect) to acquire only two pictures. In this case, you can select 2 pictures by holding down the "Ctrl" key and clicking with the mouse.

Click on the "Tile" menu to automatically create a single tiled image as shown below.

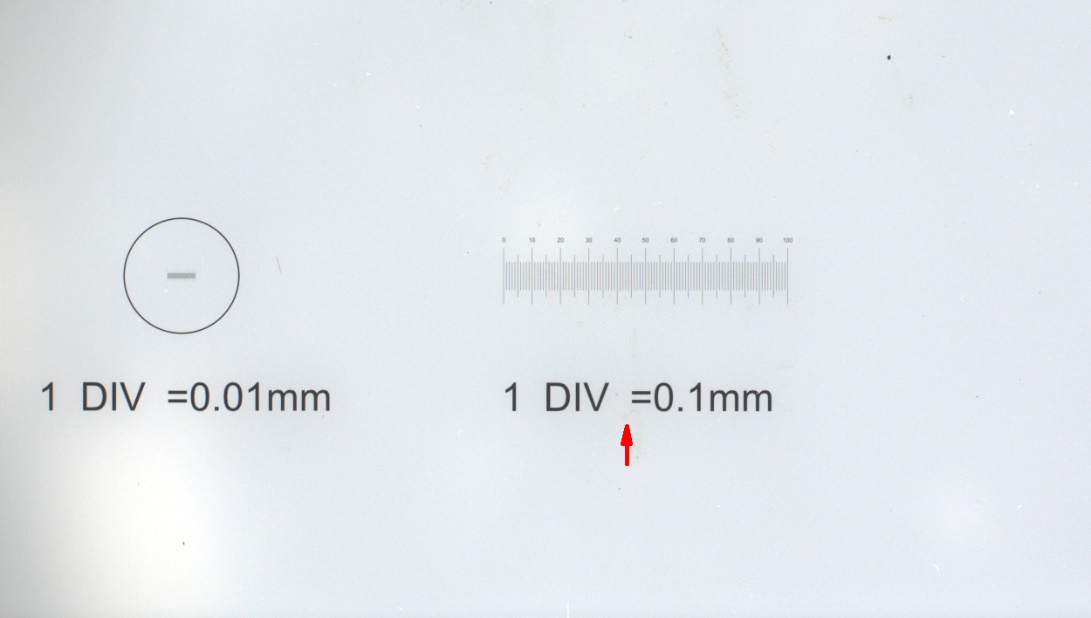
****

**Calibration**

Calibration is a necessary process to obtain actual measurement results. The program displays spatial measurements, such as object length and area, as the location and number of pixels. Calibration is the task of defining how many pixels on an image correspond to a few micrometers, a few inches, a few miles, or a few nanos.

The scale of 1 DIV 0.1 mm is often used.





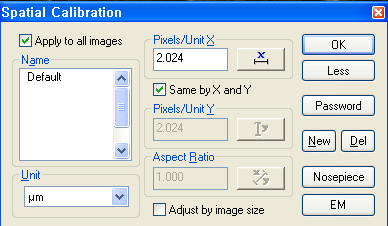
Use the **Measure** > **Calibration** command to work with spatial calibration. It is used to create a new spatial scale, to modify the existing spatial scales, to select the calibration for measuring your image, and to draw a calibration marker in your image. By default, the program expresses spatial measurements in terms of pixels, but you can use this command if you want to measure objects in terms of microns, inches, nanos, or miles.

### Spatial Calibration dialog

When you select the **Measure** > **Calibration…** command, the “**Spatial Calibration**” dialog box is displayed. You can find an example of this dialog box.

**Calibration window**

This dialog contains the existing calibration. You can apply any of them to the image. This dialog box allows you to create a new calibration. You can also modify the name, unit name, pixels-per-unit and aspect ratio values of the desired calibration. The calibration with the “**Default”** name is the default program calibration, and cannot be modified.



The **Name** list box contains the names of the existing calibrations. You can select the calibration you want to apply to the image by highlighting its name in his   
control. If you want to use the program default calibration, select “**Default**”. If the “**Default”** calibration is the only listed one, you can create a new one by clicking   
the **New** button and specifying its values.

The **Unit** combo box contains all available unit names. You can choose the desired one for the selected calibration. You can also type the name of your unit in this field.

The **Pixels/Unit X** field contains the pixels-per-unit value that displays the number of pixels that represent a single unit in both the horizontal and vertical directions. You may either enter the desired value directly into this field by typing the value, or you can click the  button to specify the values from an object of the known length in your image. Usually users click 1/100mm scale with the  button to   
obtain the pixels-per unit value.

* The **Same by X and Y** flag allows you to specify that the calibration has   
  different pixel-per-unit values in horizontal and vertical directions.
* The **Pixels/Unit Y** field contains the pixels-per-unit value that displays the   
  number of pixels that represent a single unit in the vertical direction when the pixels-per-unit value in the vertical direction differs from the same one in the   
  horizontal direction. You may either enter the desired value directly into this   
  field by typing the value, or you can click the  button to specify the values from an object of the known length in your image.
* The **Aspect Ratio** field contains the value that represents the relationship between the horizontal and vertical axes in your image. This value is the ratio of   
  the pixels-per-unit value in the horizontal direction to the pixels per-unit value  
  in the vertical direction. It is used to compensate for distortion on an image   
  acquired with a camera having an aspect ratio different from that of the   
  displaying device. You may either enter the value directly into the **Aspect   
  Ratio** field by typing the value, or you can click the  button to specify the value from an object that is known to be square in your image. You may also indirectly specify the **Aspect Ratio** by setting the **Pixels/Unit Y** value to a   
  value that is not equal to the **Pixels/Unit X** value. In this case the program   
  will automatically calculate and update the **Aspect Ratio** value.
* Click the **OK** button to apply the selected calibration to your image.
* Click the **New** button to create a new calibration.
* Click the **Delete** button to remove the highlighted calibration. The “**Default**”   
  calibration cannot be removed. Click the **Reset** button to return the highlighted calibration to its initial state, which means its values will become the same as the “**Default**” calibration.



**Tip:**

In order not to modify or delete the calibration value by mistake after completing the process, click the

**fewer buttons**

to minimize the window that only contains names of calibration ratios. You can return it to its

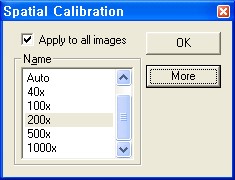
original size by clicking the

**More**

button below OK (this will be changed into

**Less,**

and vice versa).



To apply the desired calibration to the image, you need to highlight its name in the **Name** list box and click the **OK** button.

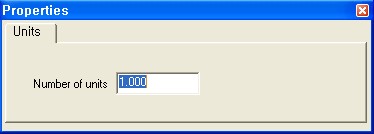
### Modify existing calibration

The “**Spatial Calibration**” dialog box allows you to modify any of the existing calibrations excluding “**Default**”.

Proceed as follows:

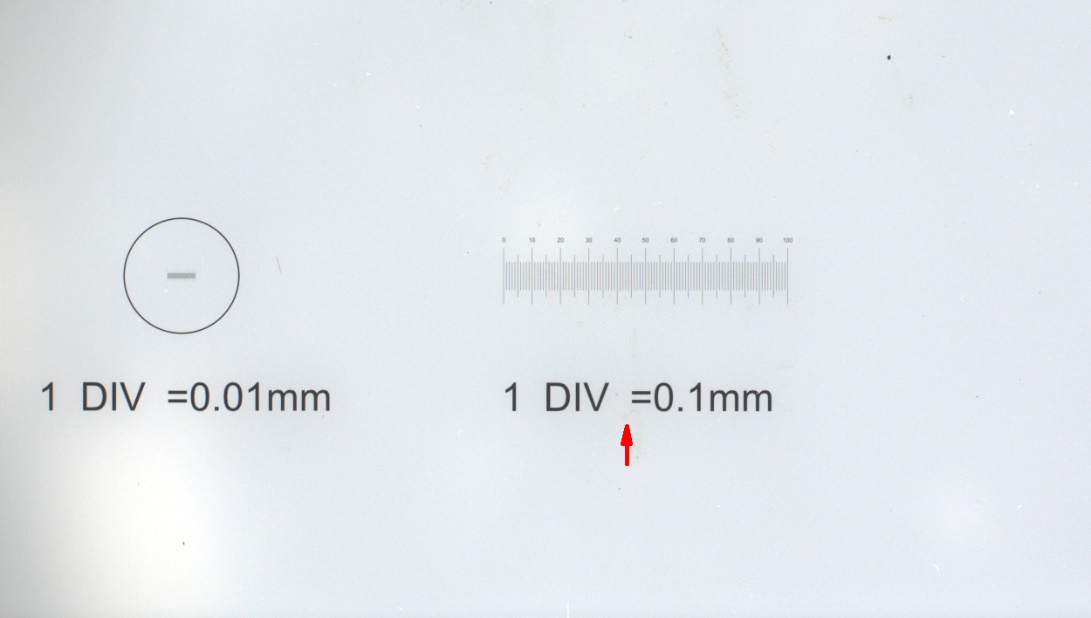
1. If you want to change the name, unit name, pixel-per-units and aspect ratio values of the desired calibration you need to highlight its name in the   
   **Name** list box and typing a new name in the in-place edit box over the   
   previous one.
2. You may change the unit name by choosing the appropriate name in the   
   **Unit** combo box. You can also type the name of your unit in this field.
3. Now you may either enter the pixels-per-unit value directly into the   
   **Pixels/Unit X** field by typing the value,

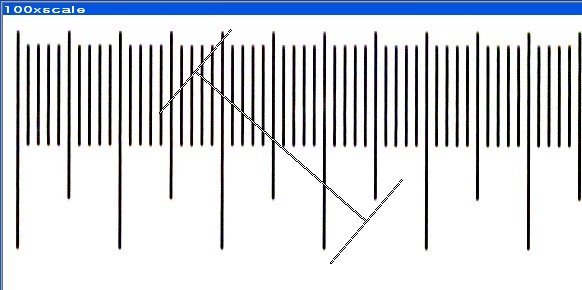
or you can click the  button to specify the values from an object of the known length in your image. When you select thisbutton, the “**Properties**” tab window containing the “**Units**” tab will be displayed, and a defining line will be placed in your image. The below shows an example of the “**Units**” tab.



1. In the **Number of units** field of this window you need to specify the   
   you must place the defining line over the length of the object to specify its size in pixels: position and then stretch the defining line so that its length is equal to the length of the reference object. Then click  button to   
   complete the measurement. The program will calculate the calibration by   
   dividing the number of pixels under the defining line by the unit number you have specified in the “**Units**” tab. The result will be placed in both the   
   **Pixels/Unit X** and **Pixels/Unit** **Y** fields.

1 DIV: 0.1mm

  
1 DIV: 0.01mm is for microscopy measurement



An example of the “defining line”.

1. If you want the calibration to have a different pixels-per-unit value in the   
   horizontal and vertical directions, you must clear the **Same by X and Y**   
   flag. Then the **Pixels/Unit** **Y** and **Aspect Ratio** fields will be enabled; otherwise these fields will be disabled.
2. If **Same by X and Y** is not set you need to specify the **Pixels/Unit** **Y**   
   value. There are two ways to do it: You can either enter the desired value directly into the **Pixels/Unit Y** field by typing the value, or you can click the  button to specify the values from an object of the known height in your image. The procedure of defining of the **Pixels/Unit Y** value is the same for defining the **Pixels/Unit X** value. After the **Pixels/Unit Y** value is   
   calculated, the result will be placed in the **Pixels/Unit** **Y** fields. If the **Pixels/Unit** **Y** value is not equal to the **Pixels/Unit** **X** value, the program will   
   automatically calculate and update the **Aspect Ratio** value. You may either enter the **Aspect Ratio** value directly into the **Aspect Ratio** field by typing the value, or you can click the  button to specify this value from an   
   object that is known to be square in your image. When you select this   
   button, a *defining line* will be placed in your image. Using your mouse, you need to position the defining line diagonally over your square object and   
   stretch the defining line so that its length is equal to the diagonal length of the square object, from corner-to-corner. Then click the  button to   
   complete the measurement. The program will calculate the **Aspect Ratio** and update the **Pixels/Unit** **Y** value if it is necessary.
3. After your calibration is defined you can apply it to your image by clicking   
   the **OK** button.
4. The program will store the new calibration automatically when you close the “**Spatial Calibration**” dialog box.

### Creating a new calibration

You can create a new calibration by clicking the **New** button in the "**Spatial Calibration**" dialog box and entering your calibration values in the appropriate fields. When a new calibration is created, the program places its name in the **Name** list box and activates the calibration fields. By default, the program assigns the name "**Spatial0**" to a new calibration; however, you may change it to something more descriptive. You may want to modify the unit name, pixel-per-units, and aspect ratio values of the just created calibration. You can do it the same way as described above.

The program will store the new calibration automatically when you close the “**Spatial Calibration**” dialog box.

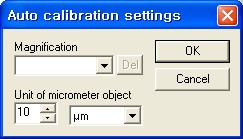
**Auto Calibration**: **Auto Calibration** allows the program to calculate the pixel-per-units value automatically and you only need to set the unit for the calibration scale and the distance between the scale marks. That is, you do not need to move the defining line at all. This function greatly improves the accuracy and repetition.

**Measure** > **Calibration > Auto** command shows the dialog box below.

**Magnification** means the magnification of the microscope. This only provides a name, not the actual calibration value. The magnification offers a drop-down style, and you also can type the name of magnification manually. In this case, you can delete what you want by clicking the **Del** button in the dialog box.

**Unit of micrometer object** sets the actual distance between the scale marks in the scale for calibration. The example below set the scale with a 10-um distance. **It can be changed.**

**OK** button will perform the Auto calibration.



An Example of the **“Auto”** dialog box**.**

### Save and load calibration

Calibration settings can be saved and loaded using special text files with **clb** extension. Command **Measure** > **Calibration** > **Save active…** is used to save the current selected calibration in its own file. This command is active only when active calibration is not the **Default**.

Command **Measure** > **Calibration** > **Save all…** is used to save all calibration currently represented in the program. All calibrations are stored in one common file. This command is active only when at least one calibration, except **Default,** is available in the program.

To open an existing file with calibration(s) use the **Measure** > **Calibration** > **Open** command. It is necessary to restart the “**Spatial Calibration**” dialog (if it was currently opened, of course) for changes.

If you want to re-install the program and use the calibration, you do not need to perform a new calibration and just use **Measure** > **Calibration > Open** command and open \*.clb file.

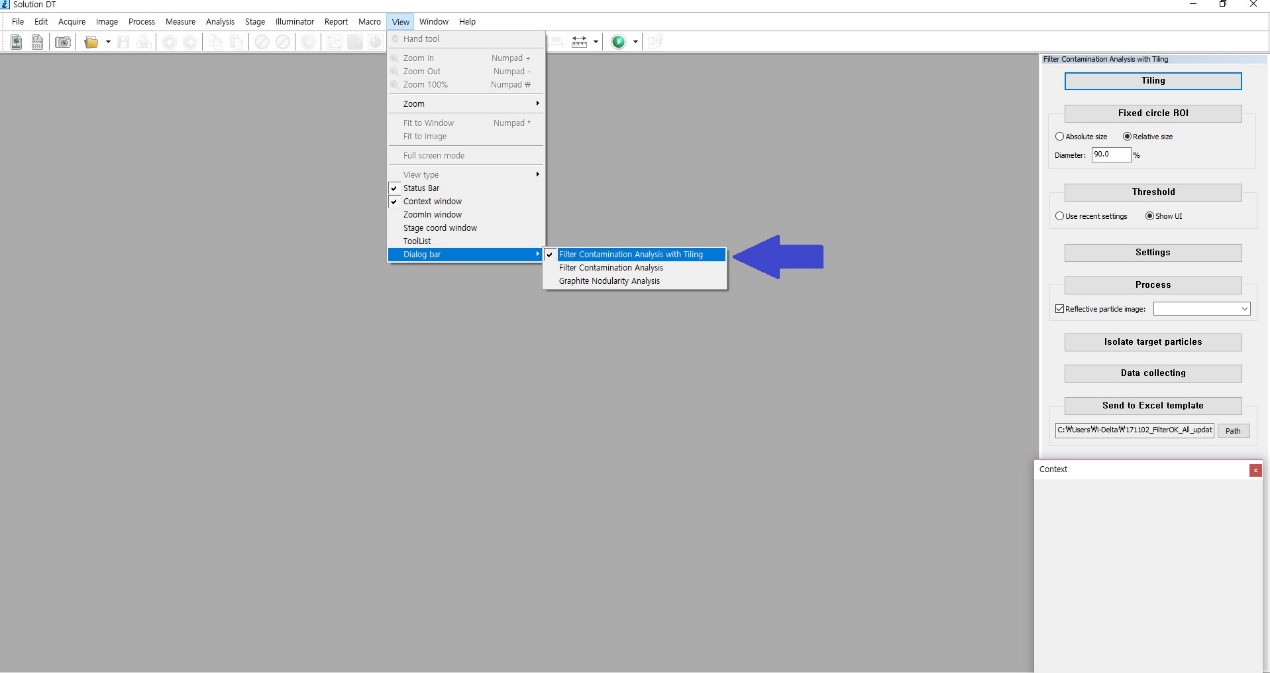
Take note that the program does NOT open \*.clb calibration file with **File > Open** command.

**Password** option does not allow changing the existing calibration if one does not know the password.

**Adjust by resolution** option lets calibration be adjusted to the image size automatically. With the option one can use all camera capture resolution with the same calibration. Calibration is adjusted to the captured image size automatically.

**Tip**: You can easily select the saved calibrations with the dropdown menu which appears by pressing the arrow on the right side of the toolbar button

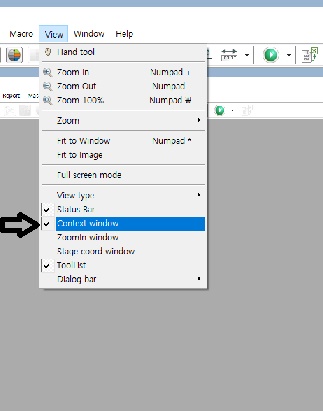
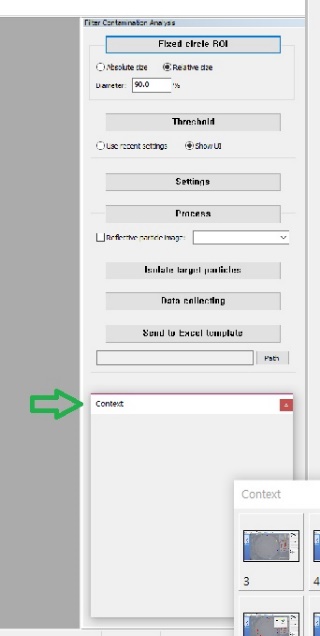
Please choose “Filter contamination analysis with Tiling” of Dialog bar in View menu.

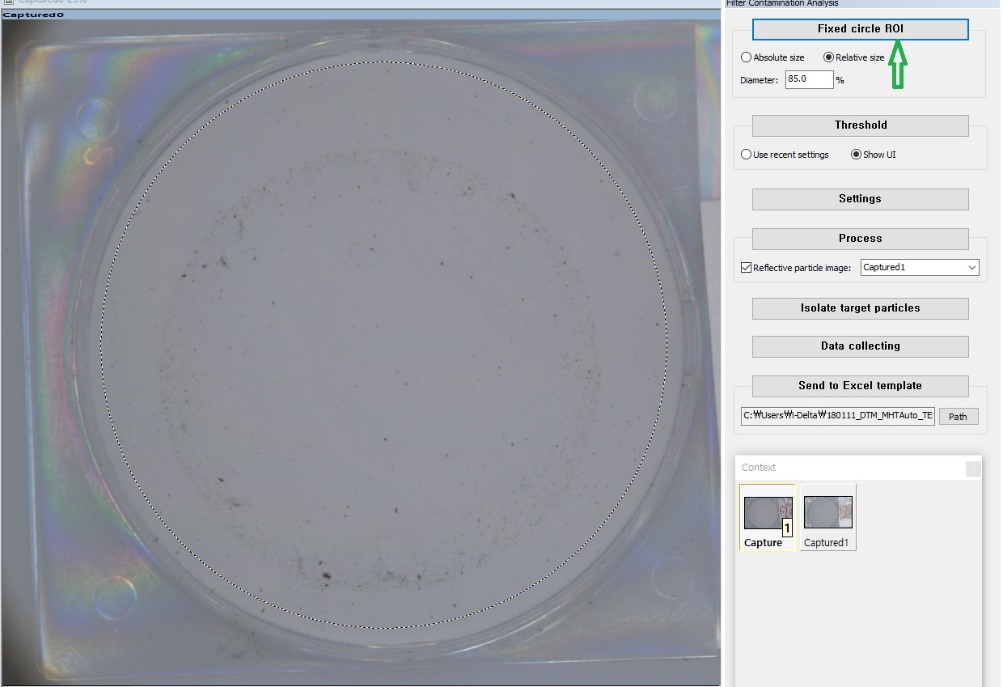




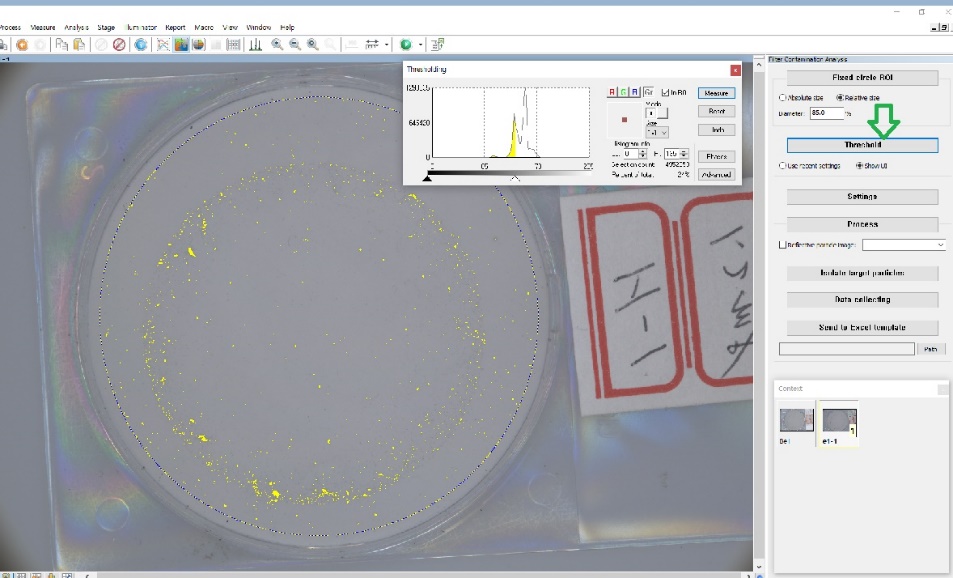
All analysis will be run in this Dialog bar. For the analysis of unrelated particles, only a slightly darker image with polarization is used. When only metal particles are analyzed, one slightly darker image with polarized light and one brighter image without polarized light are used. All types of measurements are measured with only one image that is slightly darker with polarized light. The remaining non-polarized image is used only as reference image to automatically find metal particles.

If you accidentally close the Context window, select the Context window again from the View menu as shown below.

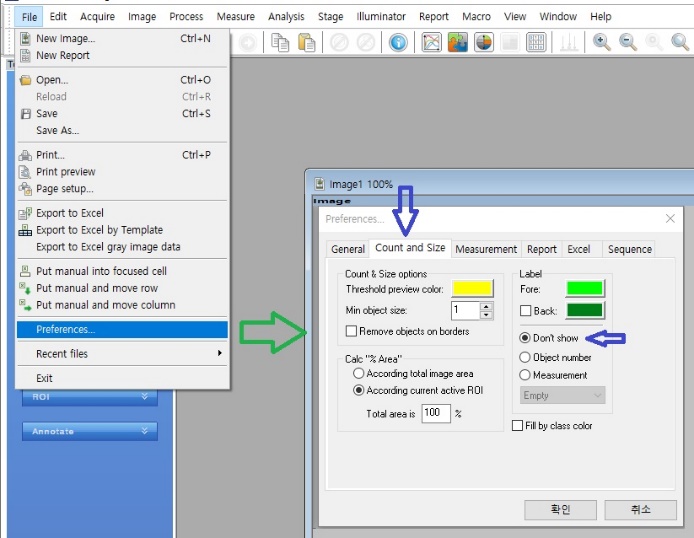
 

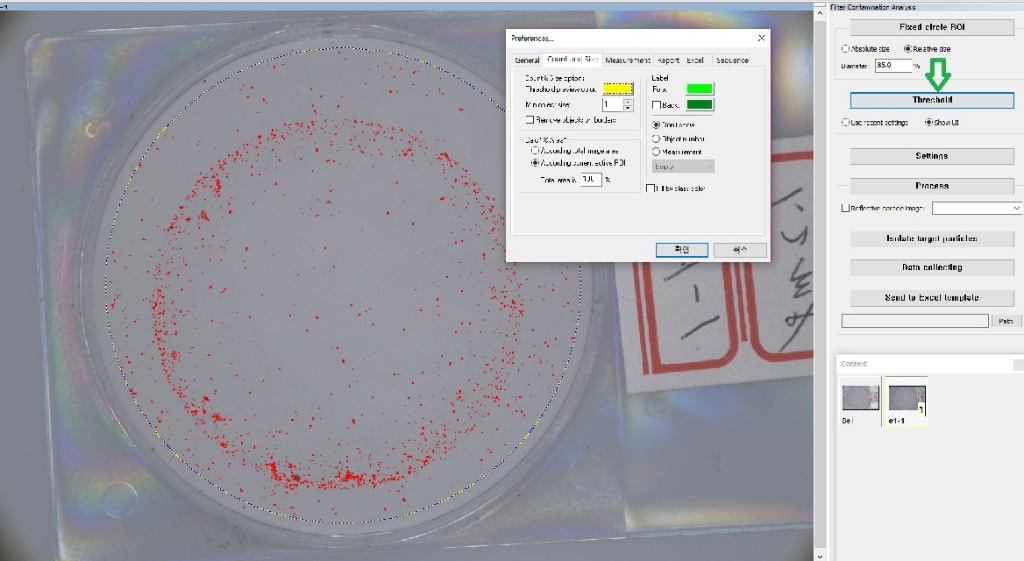
"Find ROI" determines the area to be measured. It is usually applied at 85%. However, adjust the values according to the requirements of the sample and user.

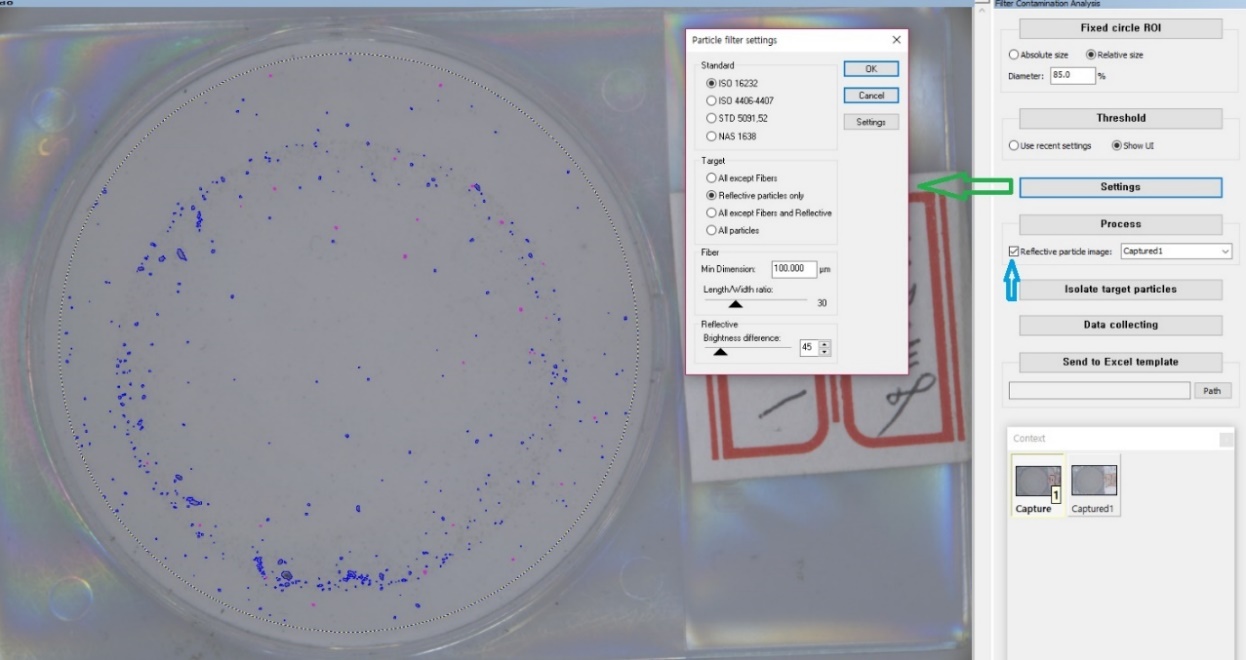
Please click "Threshold". The "Use recent settings" option will auto-advance to the previously set settings. The "Show UI" option shows the Threshold UI as shown below. Always check "In ROI" here. If not checked, the entire image will be analyzed.

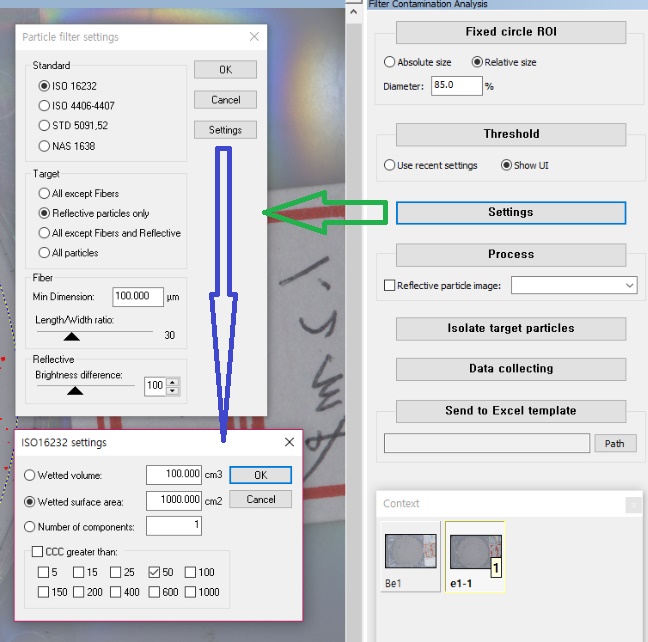


If you see the number of each object after the threshold, please select "Do not show" as shown below.





"Settings" shows the following menu window. Here you will select the required industry standard, the type of particles to analyze, and the difference in brightness to be judged by metal particles. The brightness difference in "Reflective" should be 50. It can be adjusted according to the type of sample and user's needs. Lower values will find more metal particles.



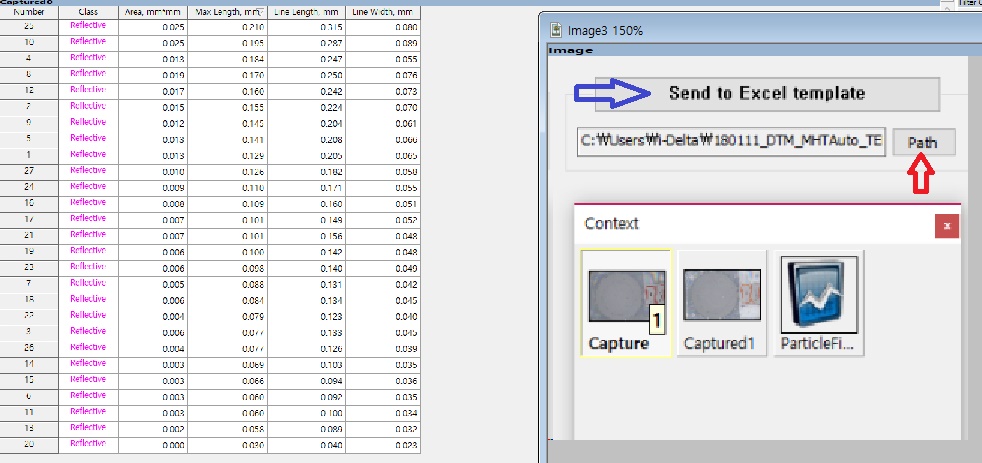
When searching and analyzing metal particles, be sure to check the "Reflective particle image" option. Choose a brighter non-polarized image to reference. In this case, all particles of the selected non-polarized image are automatically calculated for the brightness of the corresponding particles of the polarized image.

1. Select "Process" and the particles will be classified automatically.

2. Then click "Isolate target particles", and only the particles you are looking for are left.

3. Click "Data collecting" to measure the sorted particles.

4. Click "Send to Excel template" to convert the data to a short form corresponding to the selected industry standard. In this case, you must click "Path" and specify the location where the Excel template created according to the industry standard is stored.

5. Click "Send to Excel template" twice. After selecting the darker polarized image used for the measurement, click on it. After selecting the auto-generated data collector in blue, click on it. Otherwise both data and image are not exported into Excel template together.

For now, you will work with the Excel program.

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